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Hibbertia advena (Dilleniaceae), a new and rare species from Queensland with transcontinental affinities

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Abstract

The new species *Hibbertia advena* T.Hammer & Toelken is described. It occurs in north-east Queensland but shares a strong morphological affinity with members of the *H. exasperata* (Steud.) Briq. species group, which are widespread in south-west Western Australia. This may be an example of a very wide transcontinental disjunction in Australian *Hibbertia*. The biogeographic significance of such disjunctions is briefly discussed, pending further insights when a more complete molecular phylogeny of the genus is generated.

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Introduction

A distinctive species group in *Hibbertia* Andrews, the *H. exasperata* (Steud.) Briq. group, has been recognised for many years in south-west Western Australia (Wheeler 2004). The group is characterised by strongly ericoid leaves (these are small and narrow, with the margins strongly recurved or revolute and butting tightly against a usually prominent abaxial midrib) with pungent apices, pedicellate flowers with usually prominent, brown, scarious bracts at the base of the pedicel, glabrous, accrescent sepals, and usually 15 stamens grouped into bundles of three each alternating with five glabrous, 2-ovulate carpels. This set of characters is highly distinctive and is found nowhere elsewhere in the genus, resulting in species in the group being immediately recognisable.

There are strong grounds for believing that the *H. exasperata* group is a natural one. Only two species from this group were included in a molecular phylogeny of *Hibbertia* based on plastid sequences by Horn (2005), and these grouped into a clade with 100% bootstrap support. The clade is placed in a large, strongly supported clade named by Horn (2009) as *H.* subgen. *Hemistemma* (Juss. ex Thouars) J.W.Horn. Most species in subgen. *Hemistemma* have ericoid leaves, like those of the *H. exasperata* group, but none have stamens arranged all around five glabrous carpels. This staminal and gynoecial pattern is common in the other large subgenus of *Hibbertia* (subgen. *Hibbertia*), but these never have strongly ericoid, pungent leaves. The *H. exasperata* group currently comprises five named taxa, all endemic

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in Western Australia, but many more will be described in a forthcoming revision by one of us (KRT).

The species described in this paper was first collected in 1999 from the Mount Zero-Taravale Sanctuary by R.J. Cumming. It was recognised as distinct at the Queensland Herbarium, where it was phrase-named as *Hibbertia* sp. Taravale (J.E. Kemp+ 20074). Material was sent to the first author at AD, who immediately recognised it as belonging to the *H. exasperata* species group: it has all the hallmarks of the group discussed above. It is morphologically unlike any other species in eastern or northern Australia.

It is remarkable that a species that clearly belongs to a distinctive morphological species group hitherto only known from south-western Western Australia should be discovered in north-east Queensland (Fig. 1). Taxonomic and evolutionary relationships of species between the two main centres of diversity and endemism of *Hibbertia,* south-west Western Australia and eastern Australia (a third, secondary, centre of species diversity extends across the monsoon tropics of northern Australia) are very poorly understood, partly because almost all taxonomic research since Bentham (1863) has focussed exclusively on one or other of these areas. A deeper understanding of continental-scale relationships is likely to emerge from an ongoing project led by one of us (TH) that aims to produce a complete *Flora of Australia* treatment and a near species-complete molecular phylogeny of the genus.

Nge *et al.* (2022), working with a molecular phylogeny of *Calytrix* Labill. (Myrtaceae), developed a biogeographic hypothesis (the Peripheral Vicariance Hypothesis) that may help explain this anomalous new discovery. *Calytrix* has a broadly similar geographic pattern to *Hibbertia*, with centres of species diversity around the periphery of the continent (in the south-west, south-east and monsoon tropics), with only one (widespread) species in the arid centre. Nge *et al.* (2022) suggested that, despite the present paucity of species in central Australia, the genus likely originated there, spreading outward towards the periphery as the continent became progressively more arid since the Miocene, then becoming extinct in its ancestral area as increasing aridity there overcame its ecological tolerance (the species that occurs in central Australia is hypothesised to be a recent range extension from the periphery). If the *H. exasperata* species group diverged relatively early (in what may be an evolutionarily old genus) then the widely disjunct new species, and the overall biogeography of the *H. exasperata* species group and of *Hibbertia* as a whole, may be explained in a similar way. The new species is described below as *Hibbertia advena* T.Hammer & Toelken.

Methods

This study was based on examination of dried specimens at AD and those on loan from BRI and JCT.

Taxonomy

Hibbertia advena T.Hammer & Toelken, *sp. nov.*

Type: western edge of Mt Zero-Taravale Wildlife Sanctuary, c. 16.8 km W of Taravale Homestead, accesses via Laroona Ewan Rd, Queensland, 23 Mar. 2014, *R. Jensen 3116* (holo: BRI-AQ856790; iso: CANB, PERTH).

Hibbertia sp. Taravale (J.E. Kemp+ 20074), Queensland Herbarium.

Erect much-branched *shrubs* 0.8–1.5 m high, the branches becoming rigid-woody; young stems glabrous; intrapetiolar tufts of hairs to c. 1 mm long. *Leaves* widely spreading, scattered, linear, (7–) 10–20 (–25) mm long, 0.7–1.2 mm wide; base flattened, gradually constricted to a glabrous petiole 0.4–1.6 mm long; margins strongly revolute, butting tightly against the prominent abaxial midrib (thus completely obscuring the true abaxial surface); adaxial surface ± smooth or slightly tuberculate especially on the leaf edges, convex, glabrescent with very sparse antrorse simple hairs on very slight tubercles, sometimes also with finer hairs without tubercles especially near the base; abaxial surface with the midrib usually flush with the margins or occasionally slightly receded or bulging, accounting for c. 50% of the leaf width, with a distinct groove either side formed from the revolute margins, the surfaces of the groove distinctly tuberculate, the true abaxial surface (only visible by dissection) densely tomentose; apex with a straight, pungent point to 1.2 mm long formed from the excurrent midrib. *Flowers* single, terminal on lateral branches, on glabrous pedicels 0.8–1.7 mm long that elongate and somewhat recurve in fruit; primary bract at the base of the pedicel, narrowly linear-triangular, 2.2–3.8 mm long, 0.2–0.5 mm wide, pungent, entire, glabrous; secondary bracts few, triangular with sheathing bases, usually slightly larger than the primary bract. *Sepals* unequal, glabrous; midribs not prominent; outer sepals broadly lanceolate, 6.8–7.1 mm long, 3–3.2 mm wide, somewhat verrucose, with membranous margins and acute apex; inner sepals oblong-elliptic to oblong-obovate, 7.2–7.5 mm long, 4.2–4.5 mm wide, obtuse to rounded and ± mucronate. *Petals* yellow, obovate, c. 8 mm long, emarginate. *Stamens* (14)15, in 5 distinct groups of usually 3 stamens alternating with the carpels; filaments scarcely connate basally, 0.6–1.5 mm long; anthers obloid, 1.4–2.2 mm long, dehiscing by introrse, longitudinal slits, connivent; *staminodes* absent. *Carpels* 5; ovaries obovoid to compressed-globular, glabrous; styles 4–5 mm long, spreading widely from their insertions on the upper, outer ovary surface then curving upwards, with the stigmas placed above the anthers. *Ovules* 2 per carpel (rarely 1 by abortion). *Seeds* glossy, dark brown to black, to c. 2.5 mm long; aril membranous, covering basal half of seed. Fig. 2.

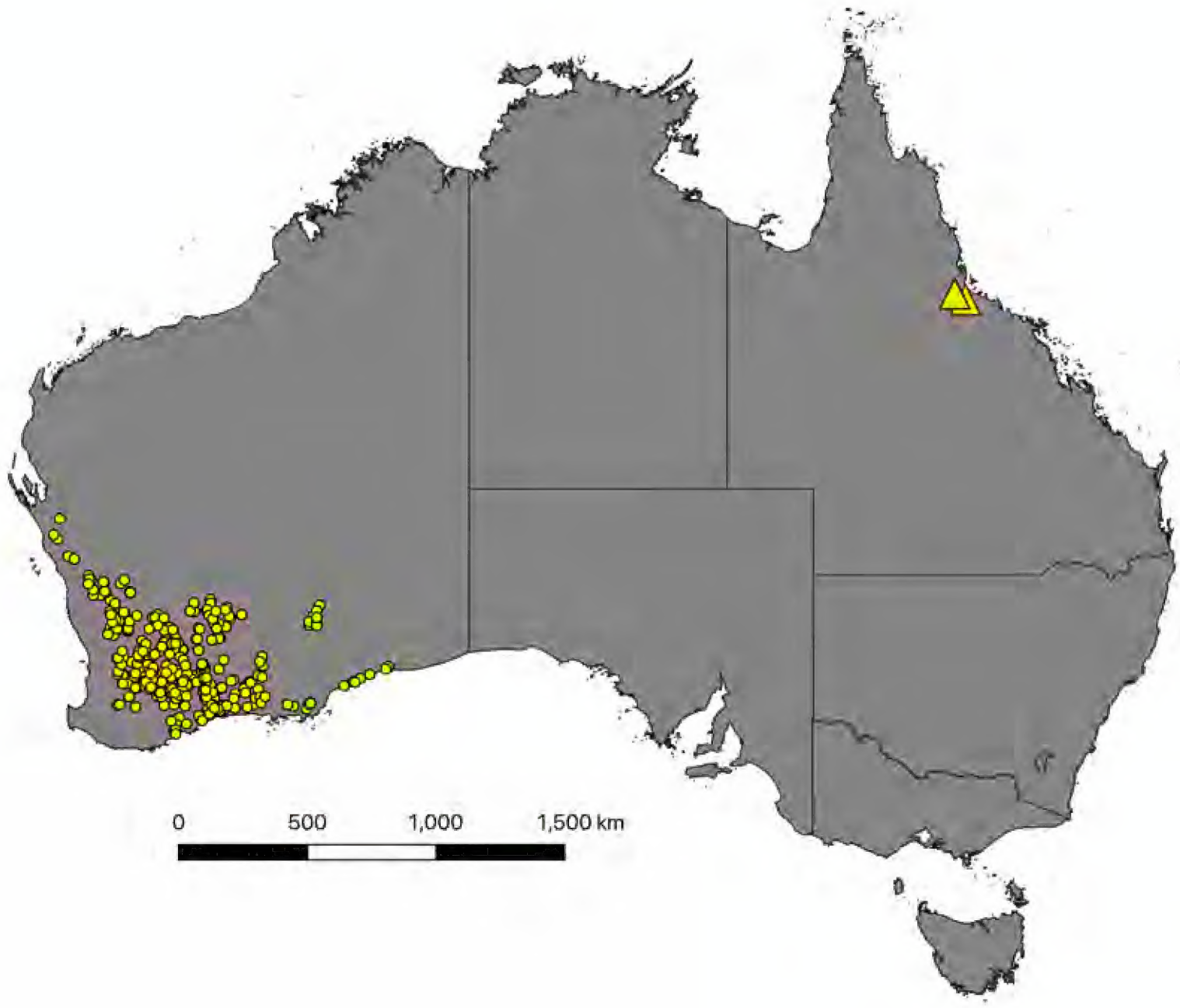

Fig. 1. Map of occurrences of *Hibbertia advena* (triangles) and Western Australia species in the *H. exasperata* species group (circles), based on specimens at BRI and PERTH respectively.

Additional specimens examined. Queensland: 18 km N of Old Greenvale Railway, 2 Jan. 1999, *R.J. Cumming 18259* (BRI); Mt Zero property, tributary of Running River Creek, 31 May 2003, *R.J. Cumming 21515* (BRI); Mount Zero property, tributary of Running River Creek, 24 Mar. 2004, *R.J. Cumming 22098* (JCT); western edge of Mt Zero/ Taravale Wildlife Sanctuary, c. 16.8 km W of Taravale Homestead, accesses via Laroona Ewan Rd, 23 Mar. 2014, *R. Jensen 3110* (BRI); approximately 1.1 km E of the Laroona Ewan Road and 680 m N of minor track, on Mount-Zero Taravale Wildlife Sanctuary, approximately 94 km WNW of Townsville, 11 Apr. 2018, *J.E. Kemp & R. Jensen JEK20074* (BRI).

Diagnostic features. Hibbertia advena can be distinguished from all other members of the genus by the combina-tion of ± glabrous, linear, straight, pungent leaves with strongly revolute margins that obscure the abaxial lam-ina and are typically level with (but may be slightly low-er or higher) than the midrib, pedicellate flowers with few to several bracts at the base of the pedicel that are linear-triangular to triangular and pungent, glabrous sepals, and usually 15 connivent stamens in 5 distinct groups of 3 stamens each, inserted between the 5 glabrous, usually 2-ovulate carpels.

Phenology. Flowers December to March and in fruit from January to May.

Distribution and habitat. Hibbertia advena is known from several locations in the Mount Zero-Taravale Sanctuary (owned and managed by the Australian Wildlife Con-servancy), and from one location in the Ben Lomond Mining lease, west of Townsville, Queensland. These locations are in the Kennedy North botanical district and Broken River subregion of the Einasleigh Uplands IBRA (Interim Biogeographic Regionalisation for Australia) region (Department of Agriculture, Water and the Envi-ronment, 2022). It has been recorded growing on sand over granitic rocks in woodlands along creeklines with *Melaleuca fluviatilis*, *Eucalyptus camaldulensis* and *Lophostemon grandiflorus*.

Conservation status. Hibbertia advena is not currently conservation-listed. The size and extent of the known populations have not been recorded. One location is on a mining lease. We recommend that its conservation status be assessed.

Etymology. The epithet is from the Latin *advena* (out-sider, foreigner, stranger), in reference to the species being morphologically unlike any other species of *Hib-bertia* in eastern Australia, and being clearly related to

Fig. 2. *Hibbertia advena*: **top** flower; **bottom** young fruit. Photos: R. Jensen.

but widely disjunct from species in southwest Western Australia. It is used here as a noun in apposition.

Proposed vernacular name. Taravale guinea-flower.

Notes. Hibbertia advena is morphologically very different from any other eastern or northern Australian *Hibbertia* species, and is most similar to species from Western Australia in the informally named *H. exasperata* species group, which also includes *H. pungens* Benth. and *H. rostellata* Turcz. All members of this group have ericoid, pungent leaves, pedicellate flowers with bracts at the base of the pedicels, and typically 15 stamens arranged around five, 2-ovulate glabrous carpels.

Given its wide disjunction, *H. advena* is unlikely to be closely allied to any of the Western Australian species in the *H. exasperata* species group. It shares straight leaf apices and few small, narrow, pungent bracts with *H. pungens*, but that species has prominently bulging abaxial leaf midribs and margins that are recurved (that is, the true leaf margins tightly abut the midribs with no grooves on either side, as occurs with species with revolute margins). Other species in Western Australia either have very short leaves, large, scarious, obtuse bracts, or uncinate leaf apices.

In eastern Australia, members of the *H. pedunculata* R.Br. ex DC. subgroup of the *H. vestita* Benth. species group (Toelken, 2013) also have ericoid leaves with an excurrent midrib, pedicellate flowers, and stamens arranged around the carpels. However, species in that group have leaves that are not pungent, stamens arranged in a ring around the carpels (rarely in two groups on opposite sides), and typically two or three densely pubescent carpels.

The strongly pungent leaves of *H. advena* are similar to *H. ferox* Jackes, which can be distinguished from the new species by having 9 (10) stamens around 2 glabrous carpels (*cf.* 15 stamens in 5 groups alternating with 5 glabrous carpels), sessile (*cf.* pedicellate) flowers, and scarious broadly lanceolate bracts that are 1.8–2 mm wide (*cf.* pungent narrowly linear-triangular bracts that are 0.2–0.5 mm wide). *Hibbertia ferox* also occurs much further inland (e.g. around White Mountains National Park) than does *H. advena*. *Hibbertia advena* can be distinguished from all other pungent-leaved species of *Hibbertia* in eastern Australia by having stamens arranged around the glabrous carpels (*cf.* stamens to one side of the usually hairy carpels).

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References

Bentham G (1863). *Flora Australiensis: a description of the plants of the Australian Territory Volume I. Ranunculaceae to Anacardiaceae* (Lovell Reeve: London).

Department of Agriculture, Water and the Environment (2022) Australia's bioregions (IBRA), IBRA7, Commonwealth of Australia. https://www.awe.gov.au/agriculture-land/land/nrs/science/ibra [accessed 1 April 2022].

Horn JW (2005) 'The phylogenetics and structural botany of Dilleniaceae and *Hibbertia* Andrews.' Ph.D. Thesis (Duke University: North Carolina, USA.)

Horn JW (2009) Phylogenetics of Dilleniaceae using sequence data from four plastid loci (*rbcL*, *infA*, *rps4*, *rpl16* intron). *International Journal of Plant Sciences* 170(6): 794–813.

Nge FJ, Biffin E, Waycott M & Thiele KR (2022) Phylogenomics and continental biogeographic disjunctions: insight from the Australian starflowers (*Calytrix*). *American Journal of Botany* 109(2): 291–308.

Toelken HR (2013) Notes on *Hibbertia* subg. *Hemistemma* (Dilleniaceae) 9. The eastern Australian *H. vestita* group, including *H. pedunculata* and *H. serpyllifolia*. *Journal of the Adelaide Botanic Gardens* 26: 31–69.

Wheeler JR (2004) An interim key to the Western Australian species of *Hibbertia* (Dilleniaceae). *Nuytsia* 15(2): 311–320.

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